DIRECTIONS FOR THE DISSECTION OF THE CAT

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BY

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To

C. C. B. and R. O. B.

PREFACE

An introductory study should include the method, the language, the substance, and some knowledge of the literature of the subject. The method of anatomy is exploration, direct observation, and comparison,—the most fundamental and most widely applicable of scientific methods. The importance of observation was urged repeatedly by Sir William Osler, foremost clinician of his time. He said, "See, then reason and compare and control. But see first." This injunction needs emphasis now, when students enter college with the idea that all science is experimental.

It is hoped that a student who follows carefully the directions in this book will be able to obtain by his own effort, without loss of time, a sound knowledge of the elements of mammalian anatomy, and incidentally to acquire familiarity with the language of the subject. The selected list of references is intended to furnish an introduction to the literature and a guide to information unobtainable in the laboratory. The few illustrations are to help over hard places.

It is important to realize that—"The various organs . . . are not isolated, but complex parts of a complex whole" (Osler). A program of dissection, so arranged as this one is, that it may be carried out on a single specimen will help that realization, and has the additional advantage of economy of material.

Designed as a preliminary to the study of human physiology and personal hygiene, the procedure recommended here deals chiefly with parts of functional, rather than morphological, interest. It is the result of the experience of many years; and this revision has, in addition, the benefit of an

intensive study recently made under ideal conditions of space, light, and temperature, with access to an excellent library, for which the author has to thank the Marine Biological Laboratory, at Woods Hole.

R. P. BIGELOW

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February, 1935.

CONTENTS

ILLUSTRATIONS

DIRECTIONS FOR THE DISSECTION OF THE CAT

I. INTRODUCTION

The Material. Man and the Domestic Cat are classed by zoologists as Mammalia,—Man in the Order Primates, the Cat in the Order Carnivora, Family Felidæ. While this family, including the Lion, Tiger, etc., contains the most highly specialized of meat-eating mammals, their internal anatomy differs but little from human anatomy, except in those parts that in the Primates (in Man to the highest degree) are modified in harmony with the erect posture and enlarged brain, characteristic of that order.

Thus the anatomical characteristics, together with the convenient size and abundance of the Cat, make of this species favorable material for an introductory study of mammalian anatomy, especially as a preliminary to the study of medicine.

Felis domestica Brisson is the Latin name usually applied to the Domestic Cat, and generally it has been assumed that this form was derived from the Wild Cat of Europe, *F. silvestris* Schreber. But the Wild Cat differs in several features, including a thicker coat of hair at the tip of the tail, which tapers in the domestic form. The latter, according to authorities quoted by Weber ('28 II, p. 320), was derived from the African *Felis ocreata* Gmelin, probably by domestication at an early period in Egypt, whence it spread with other products of Egyptian civilization to all parts of the world. The domestic variety, then, may be distinguished from its

wild progenitor, as *Felis ocreata* var. *domestica*, unless one prefers an earlier name, *F. catus*, that, according to Pocock (1907), was applied by Linnæus to one variety of the Domestic Cat.

Preparation. Excellent material for the dissection of the Cat may be obtained from dealers in biological supplies. If it be desired to make the preparation in the laboratory, this may be accomplished as follows:

The animal, having been killed by illuminating gas (CO leaves blood vessels dilated), chloroform, or other convenient means, should be injected with an embalming fluid, either,—

(1)	Borax	5 grams
	Water	800 c.c.
	Glycerine	160 c.c.
	Formaldehyde (40 per cent. sol.)	40 c.c.
or (2)	Phenol (liquid carbolic)	30 c.c.
	Formaldehyde (40 per cent. sol.)	15 c.c.
	Glycerine	100 c.c.
	Water	855 c.c.

From 300 to 500 c.c. of this fluid will be required for each body. The embalming is accomplished best by allowing the fluid to flow through a cannula tied into the left femoral artery and connected by rubber and glass tubing to a pressure bottle placed four or five feet above the specimen. It is desirable to use as large a cannula as can be introduced into the artery. Before insertion, a piece of soft rubber tubing about 10 cm. long should be attached to the cannula, filled with fluid, and clamped with an artery forceps.

If the metal cannulæ manufactured by the Harvard Apparatus Company are used, the ends of the ligature threads [1] should be passed, after the cannula has been tied in place, in opposite directions behind the artery and tied

[1] Black cotton No. 50 makes good ligatures.

together again in front close to the first knot. This second loop, if firmly tied, will usually prevent the cannula from being forced out of the artery by the back pressure. If the animal has been freshly killed, it may be well to fill the cannula with a 30 per cent. solution of magnesium sulphate to prevent clotting of the blood.

After the body has been embalmed, the blood vessels should be injected with a colored starch mass. This is composed of,—

Laundry starch (lumps)	85 grams
Water	100 c.c.
Glycerine	20 c.c.
Formaldehyde (40 per cent.)	20 c.c.

The suspension of starch in water must be freed from all coarse particles by being passed through a fine wire strainer or gauze folded several times. Then add the glycerine and formaldehyde. To produce a red color, add one or two grams of powdered carmine and a few drops of ammonia rubbed together to form a paste. For a blue color add one or two grams of soluble Prussian blue. About 50 c.c. of the red mass will be needed for the arteries and a little more of the blue for the veins. A smaller amount of the uncolored mass may be reserved for the portal veins. Another formula for the red mass has been proposed by Kellner (1934).

The best instrument to use is the ordinary brass syringe [1] for injections with a capacity of about 60 c.c. Its nozzle will fit into the short piece of rubber tube attached to the cannula.

The arteries may be injected most conveniently through the cannula that has been tied into the femoral artery. For the veins the cannula may be tied into the left femoral vein or into the right external jugular. The latter position has

[1] Made by Collin, Paris, France.

the advantage of lessening the risk of rupture of the delicate veins in the abdominal cavity.

Very beautiful injections may be obtained if the cannulæ are inserted in the living animal under ether anæsthesia, the clamp removed from the venous cannula, and the animal allowed to bleed to death while under the anæsthetic. But injection without bleeding gives sufficiently good results. Excellent results are obtained also, especially for histology, by the method of Gustav Mann (1902, p. 97, pp. 144–146, 157–162).

During dissection the skin should not be removed from the body and should be kept as intact as possible. After each exercise all cut surfaces must be bathed thoroughly with a preserving fluid, and the flaps of skin returned to their natural positions and tied in place. Cover the exposed flesh with gauze soaked in the preserving fluid, and wrap the body tightly in several thicknesses of clean diaper cloth, and store in a cool place.

The preserving fluid for cadavers may be the embalming fluid, or may be one part glycerine in four parts 3 per cent. phenol solution, or the following (Schaeffer):

Glycerine	100 c.c.
Alcohol 95 per cent.	50 c.c.
Phenol ("liquid carbolic")	10 c.c.
Water	840 c.c.
Thymol	0.5 grams

If the body has to be kept at room temperature without attention for a week or more, or if danger threatens from drying or from mold, it should be immersed in a 3 per cent. solution of phenol:—

Phénol pure crystals	30 grams
Water	1000 c.c.

With these precautions carefully observed, the embalmed body may be kept in perfect condition until the dissection is completed. The time required is estimated to be about 60 laboratory hours.

Equipment. Each student should possess a seeker (a stiff blunt-pointed instrument; not a probe, which is flexible with a bulbous end); two scalpels, one tapering, the other with a straight back; two forceps, coarse and fine; two scissors, large and small; several hooks with cords attached; and he should be provided with a dissecting board about 8 × 27 inches, with cleats at the sides and ends.

In the laboratory there should be available,—preserving fluid, gauze, gauze sponges, diaper cloth, cobbler's bristles, ligature threads (No. 50 black cotton cut in 10-inch lengths), aneurism needles for ligating, artery forceps, blow pipes, bone forceps, fine saws, a whetstone, and small pans or glass dishes.

General Directions. Cutting instruments must be sharp. When beginning the day's work have all instruments assembled and ready. Read a page or two of the Directions before dissecting the parts to which they refer.

The names and dates in parentheses refer to the list of works for collateral reading, page 63. By looking these up promptly the student will obtain valuable practice in the use of the library and a breadth of view that otherwise may be lacking. The student at the beginning should examine, if possible, the beautiful plates by Straus-Durckheim, 1845.

Terms of Position and Direction. These terms, commonly used in comparative anatomy, should be memorized:—anterior, toward the snout (superior, rostral, or cranial in human anatomy); posterior, toward the tail (inferior or caudal in human anatomy); dorsal, toward the back (posterior in human anatomy); ventral, toward the belly (anterior in human anatomy); median, in the vertical plane

dividing the body into right and left halves; medial, toward the median plane; lateral, toward the side; sagittal, parallel to the sagittal suture in the median plane of the skull; proximal, near the attached end; distal, near the free end.

II. SKELETON (Osteology)

The frame-work of the body is composed of three tissues,—bone, cartilage (gristle), and fibrous connective tissue. The hard parts connected by ligaments of connective tissue form the Skeleton. Study a prepared skeleton and bones of the cat in comparison with those of man and other vertebrates (Reighard and Jennings, '30, pp. 1–92; Straus-Durckheim, '45; Frazer, '20; Broom, '30; Cunningham, '31, pp. 90–305).

MOUNTED SKELETON

Note division into

1. Axial skeleton consisting of—
   a. Skull.
   b. Vertebral column, backbone.
   c. Ribs.
   d. Sternum, breastbone.
2. Appendicular skeleton.
   a. Shoulder girdle, or pectoral arch.
   b. Fore limbs.
   c. Pelvic girdle; hip, or haunch bone.
   d. Hind limbs.

Note the general arrangement of the bones in each part, including curves and angles, points of attachment, articular surfaces where visible, and consider how these features may be adaptive. Compare with human skeleton.

3. Divisions of the skull.
   a. Cranium, brain case.

b. Facial bones, enclosing the nasal cavity.
c. Visceral skeleton,—mandible, hyoid, ear-bones.

4. Divisions of the vertebral column.
   a. Cervical, neck.
   b. Thoracic, chest.
   c. Lumbar, loin.
   d. Sacral, attached to the Pelvis.
   e. Caudal, tail.
      How many vertebræ in each division, how distinguished, and what other bones are attached to them?
5. Ribs (Costæ).
   How many?
   Articulations with vertebræ.
   Articulations with sternum.
   Are the ribs all alike; if not, how do they differ?
   Of what tissues are they composed?
6. Sternum.
   a. Manubrium (anterior segment).
   b. Corpus, how many segments and how related to the ribs?
   c. Xiphoid process (posterior segment).
      Compared with human sternum, which is the more primitive? (Cunningham, p. 112, fig. 126.)
7. Shoulder girdle (Broom, pp. 106–117).
   a. Scapula (shoulder blade).
      1. Articular surface = glenoid fossa.
      2. Coracoid process on border of fossa.
      3. Spine of the scapula.
      4. Acromion, tip of the spine.
      5. Vertebral border, dorsal.
   b. Clavicle (collar bone).
      Compare with human clavicle.

8. Fore limb.
   a. Humerus, upper arm bone.
   b. Radius and Ulna, fore arm bones.
   c. Carpus, wrist, how many bones and how arranged?
   d. Metacarpus, palm, how many bones?
   e. Phalanges digitorum manus, finger bones.
9. Pelvic girdle, Pelvis.
   a. Foramen obturatum.
   b. Articular surface = acetabulum.
   c. Three divisions of Innominate bone, Os coxæ (Cunningham, fig. 225).
      1. Ilium articulates with Sacrum.
         Crest of the Ilium.
      2. Pubis unites with its fellow of the opposite side in the Symphysis pubis.
      3. Ischium posterior to Obturator foramen.
10. Hind limb.
   a. Femur, thigh bone.
   b. Patella, knee cap.
   c. Tibia and Fibula, leg bones.
   d. Tarsus, how many bones and how arranged?
      Note especially the ankle bone = Talus, or Astragalus.
      Heel bone = Calcaneus.
   e. Metatarsus, how many bones?
   f. Phalanges digitorum pedis, toe bones.

Study the homologies of the limb bones (Cunningham, pp. 301–304; Broom, pp. 136–144).

DISARTICULATED SKELETON

Study and **draw** views of the skull proper, whole and bisected. Find the name of each bone, suture, and foramen, and label your drawings.

Draw the Mandible and label the parts.

Determine the dental formula of the cat (Wilder, '23).
Study and draw the following:
The hyoid bone.
The 1st, 2nd, and 7th cervical vertebræ.
A thoracic, a lumbar, and a caudal vertebra.
The sacrum.
A typical rib (1st to 10th).
The sternum.
Bones of the appendages and their girdles.

III. EXTERNAL FEATURES

Distinguish the external features that are characteristic of mammals generally and those that characterize the family Felidæ. Note the form and proportions of the parts and compare with homologous structures in Man.
Observe:
Hair.
1. Arrangement (H. H. Wilder, '23, pp. 103–107).
2. Color (Whiting, '18).
3. Pattern (Pocock, '07).
4. Vibrissæ, or whiskers (Walter, '28, fig. 189).
5. Hairless areas, their sensitivity?

Form of body, symmetry.
Parts of the body (Ellenberger and Baum, '91, pl. 1; Sobotta, '32. I, pp. 261–264; Spalteholz, '32–'33, pp. 255–258; Barker, '07. 2 pls. op. p. 103).
1. Head.
   a. Face, snout.
      1. Mouth, lips, teeth.
      2. Nose, nostrils.
      3. Eyes, their direction.

4. Eyelids; upper, lower, inner, or nictitating membrane in the medial corner.

b. Cranium.

1. External ears = auriculæ.
2. Occiput.

2. Neck.
3. Trunk,—regions:

a. Back = dorsum.

b. Chest = thorax. Note ratio of breadth to depth.

c. Belly = abdomen.

Nipples, their number and position.

d. Pelvic, or sacral region, hips.

1. Anus (intestinal orifice) separated by the
2. Perineum, crotch, from the
3. External genital organs, urogenital orifice.

4. Tail,—length, arrangement of hair.
5. Paired appendages:

a. Fore limbs:

1. Axilla = arm pit.
2. Upper arm = brachium.
3. Fore arm = antibrachium.
4. Elbow = cubitus.
5. Hand = manus.
6. Wrist = carpus.
7. Fingers = digiti manus, how many?
8. Claws. Are they retractile? (Walter, p. 224.)

b. Hind limbs:

1. Groin = inguen.
2. Thigh = femur.
3. Leg = crus.
4. Knee = genu.
5. Foot = pes, what part touches the ground? Is the Cat plantigrade or digitigrade? *Cf.* Horse and Man.

6. Heel = hock = calx.
7. Toes = digiti pedis, how many?
8. Claws.

IV. MUSCLES OF THORAX AND ABDOMEN

The animal having been killed, the body prepared as directed in the Introduction, and fastened in supine position upon the dissecting board:

Make a longitudinal incision through the *skin* extending along the mid-ventral line from the anterior end of the sternum to the symphysis pubis. On the *right* side from each end of the first incision **make an incision** at right angles to it through the *skin* and extending to the shoulder and the groin respectively, and from the shoulder extend the incision along the anterior aspect of the arm to the elbow.

Separate the flap of the skin from the underlying flesh (muscle) and sinews (connective tissue) dorsally nearly to the dorsal median line, on the right side only, taking care not to injure any structures in axilla and groin.

In the groin find and double ligate the Superficial epigastric artery and vein, usually imbedded in subcutaneous fat (Sobotta, '32, p. 606), and cut between ligatures.

(NOTE. If the subject is a female with well developed *mammæ*, leave these glands attached to the body, cutting around the nipples. **Draw.**)

Note the *superficial fascia* (sheet of connective tissue) containing fat and the *great cutaneous* muscle, or *panniculus carnosus* (Langworthy, '24, figs. 1, 3, 5, 6). Part of this may come off with the skin.

Remove all loose connective tissue, mammæ, if present, etc.

Observe Linea alba, raphe of white connective tissue, in the ventral median line.

Parts of a Muscle: Belly, the fleshy portion composed of muscle fibres; Action, direction of pull, parallel to the fibres; Tendon, terminal connective tissue for attachment; Origin, fixed end; Insertion, movable end.

To dissect a muscle:

1. Clean off all loose connective tissue and fat from its surface and note the direction of its fibres.
2. Find the edges of the muscle (the exit of a blood vessel or nerve may serve as a guide) and separate it there from adjacent structures.
3. Lift up edge of muscle and with the seeker tear away the connective tissue that binds it to underlying structures.
4. When it becomes necessary to **remove** a muscle always cut first through the belly of the muscle at right angles to the course of its fibres and turn back the ends. These may be cut off later when necessary. A seeker is helpful if inserted beneath the proposed plane of incision.

Dissect away the panniculus carnosus at its origin on the muscles of the thorax, so that their edges become clearly defined. (Where is this muscle inserted, and what is its function?)

Note origin, insertion, action, and other relations of the following muscles:

1. Latissimus dorsi, a broad sheet of muscle extending from near the dorso-mid line to the humerus and covering the antero-dorsal parts of the thorax and abdomen. **Do not try to find its insertion.**
2. Clavo-brachialis, from clavicle to bend of elbow. Separate it at its medial edge. Cut across it and reflect both ends.

3. Breast muscles (Langworthy, '24, p. 54), a thick mass of four muscles extending transversely from the sternum and connecting the arm and thorax:
   a. Pectoantibrachialis, a small flat bundle, arising from the manubrium and inserted on the fore arm near the bend of the elbow. Separate first along anterior margin near insertion, difficult near origin. The posterior margin coincides with that of the next, 3 *b1*.
   b. Pectoralis major.
      1. Superficial layer in front of *a*.
      Note the relation of this to an arm muscle, the clavo-brachialis (from clavicle to ulna), and separate the two.
      2. Deep portion under *a* and *b1*.

Cut *a and b*, and on the inner side of *b* find the branches of the thoracica longa artery and vein, also the second anterior thoracic nerve.

   c. Pectoralis minor, a fan-shaped mass of fibres thicker than the pectoralis major and partly covered by it.
   d. Xiphihumeralis, a long thin muscle at the posterior edge of *c*.

Cut *c and d* and find the origin of 1, the latissimus dorsi.

4. External oblique (Bradley, '27, fig. 4), a thin muscle covering the whole abdomen and part of the thorax. The fibres end in an aponeurosis (broad thin tendon) which forms part of the covering of the next, 5.

Cut the aponeurosis, being very careful not to cut into the underlying muscle. Find the insertion of the aponeurosis and the edge of the next muscle.

5. Rectus abdominis, a longitudinal muscle extending from the pubis to the 4th rib and by aponeurosis

to the 1st and 2nd ribs, and separated from its fellow by the linea alba. Does it show evidence of segmentation?

6. Transversus costarum (sterno-costalis externus), a thin muscle covering the anterior end of the rectus abdominis.
7. Scalenus. Trace thoracic part only, which consists of three portions, dorsal, middle, and ventral, taking origin from the ribs and extending into the neck.

Cut the middle part of 7 and the latissimus dorsi, and turn back the flaps.

8. Serratus anterior (serratus magnus), continuous anteriorly with the levator scapulæ (Reighard and Jennings, fig. 73 *i* and *h*). Find its origin and insertion.
9. Intercostal muscles. Seen best under the external oblique.
   a. External.
   b. Internal.

   What is the direction of the fibres in each? What is their function?
10. Internal oblique. Note its extent and the direction of its fibres.

Cut the aponeurosis of 10 near insertion of muscle fibres, and separate this muscle from the next. What is the relation of the aponeurosis of insertion of 10 to the rectus abdominis muscle?

11. Transversus abdominis, the inner muscle of the abdominal wall. May be seen in part through the aponeurosis of 10. Trace its fibres in both directions.

Make two lists of the muscles observed so far:—(1) extrinsic muscles of the fore limb, connecting limb or

shoulder girdle to the trunk; (2) purely axial, trunk and neck, muscles.

V. ABDOMINAL VISCERA

Dissect off a flap of skin from the left side of the body as previously done for the right side.

Make a longitudinal incision through the body-wall parallel to the linea alba a little to the *left* of the median line and extending from the xiphoid process to the symphysis pubis. From the middle of this incision make a short transverse cut on each side, and sponge out any liquid that may have accumulated in the body-cavity.

Observe:

1. Body-wall. How many layers? What are they?
2. Abdominal cavity, limited anteriorly by the
3. Diaphragm (characteristic of the Class Mammalia).
4. Peritoneum:
   a. Parietal, lining the body-wall.
   b. Visceral, serous coat of the organs.
   c. Mesenteries and ligaments.
5. Great omentum, a fold of mesentery lying upon the
6. Coiled intestine, and attached to the
7. Greater curvature of the stomach, and to the
8. Spleen, large brownish body on the left.
9. Liver, brown body on the right.
10. Urinary bladder.

Lift very gently the great omentum, taking great pains not to tear any part of it.

Lift the loop of intestine in the right anterior part of the abdomen, and in the duodenal mesentery **find** the Superior mesenteric vein (Fig. 2, page 21).

Inject the Portal system with white starch through a cannula inserted in the superior mesenteric vein between the inferior mesenteric and gastro-splenic veins (p. 22).

(NOTE. This procedure is impracticable and unnecessary if a solid clot is visible in the mesenteric veins.)

Examine the great omentum, its

Structure. Examine a fragment under the microscope.

Attachments to organs and body-wall. With the fingers separate the folds of the omentum to demonstrate the

Omental sac; compare human anatomy. (The Foramen of Winslow is the opening of the omental sac, and may be seen later.)

Explore the abdominal cavity as thoroughly as possible *without* cutting or tearing anything, **observing:**

1. Large Intestine. Its position and divisions, beginning at the posterior end:
   a. Rectum, straight intestine.
   b. Colon, its curvature.
   c. Cæcum, blind end of large intestine.
      How connected with the small intestine?
      Is there an Appendix vermiformis?
2. Small Intestine.
   a. Ileum.
   b. Jejunum.
   c. Duodenum.
      Can you find boundaries between these parts?
      Compare human anatomy.
3. Mesentery—notice its
   a. Attachments to the intestines, to the body-wall, other attachments. (Names of principal parts, —mesocolon, mesentery proper, mesogaster.)
   b. Blood vessels.
   c. Lymph glands. The largest of these is called the "Pancreas of Asellius."

4. Spleen, Lien, its size, form, position, and attachments.
5. Liver, Hepar. Details to be studied later.
6. Stomach, Ventriculus (gaster), its form and position:

NOTE. If it is empty and contracted, study details later, p. 33.)

   a. Pylorus, junction with small intestine.
   b. Greater curvature—left and posterior sides.
   c. Lesser curvature,—right side.
   d. Cardia, junction with œsophagus.
   e. Mesogaster, joining body-wall.
   f. Gastro-hepatic omentum, to liver.

7. Pancreas, its lobes, right and left, and their relations to the duodenum and to the stomach, mesentery, and spleen.
8. Diaphragm, anterior to the liver and the stomach.
9. Kidney, Ren, one on each side, partly covered by Perirenal fat.

   Are they symmetrical in position?

10. Urinary bladder. Vesica urinaria.
    a. Suspensory, middle umbilical, ligament of the bladder.
    b. Lateral ligaments, laden with fat. (In the male a Vas deferens will be found here on each side.)

Note attachments of *a* and *b* to the body-wall.

11. Retrovesical excavation, dorsal to the bladder. How deep?
12. Female reproductive organs:
    a. Uterus.
    b. Ovaries.
    c. Broad ligaments, longitudinal.
    d. Round ligaments, lateral toward groin.

VI. AUTONOMIC NERVOUS SYSTEM— ABDOMINAL SYMPATHETIC

(Cunningham, '31, pp. 790–793, figs. 643, 645. Toldt, '23, pp. 892–899.)

Remove part of the great omentum, to open the omental sac, leaving a fringe of half an inch or more at the attachments. Be careful *not* to cut close to the stomach or between it and the spleen, and *not* to cut between the pancreas and the spleen.

Lift the duodenum and turn it with the rest of the intestine to the left. Fasten it there with a hook. Cut away parts of the liver that obscure the view. With the seeker, tease away the peritoneal layer of the mesentery opposite the anterior end of the kidney, so as to expose the

1. Superior mesenteric plexus, a thick layer of nerve fibres, lying upon the Superior mesenteric Artery.
2. A large Lymphatic vessel may be observed anterior to and parallel with the artery.

Carefully follow the nerves dorsally with the seeker to expose the

3. Right Cœliac ganglion, being careful not to injure the Vena Cava.
4. Hepatic plexus, a network of nerve fibres running anteriorly from the ganglion along the Cœliac and Hepatic arteries.

Turn the entire intestine and the stomach as far as possible to the right, and fasten it there.

Find, without cutting anything,

Left kidney.

Left suprarenal body.

Cut through the peritoneum, in a male, on the lateral side of the kidney and of the perirenal fat; in a female, cut

laterally to the broad ligament of the uterus, page 17;—being careful not to cut the Ureter or any blood vessels.

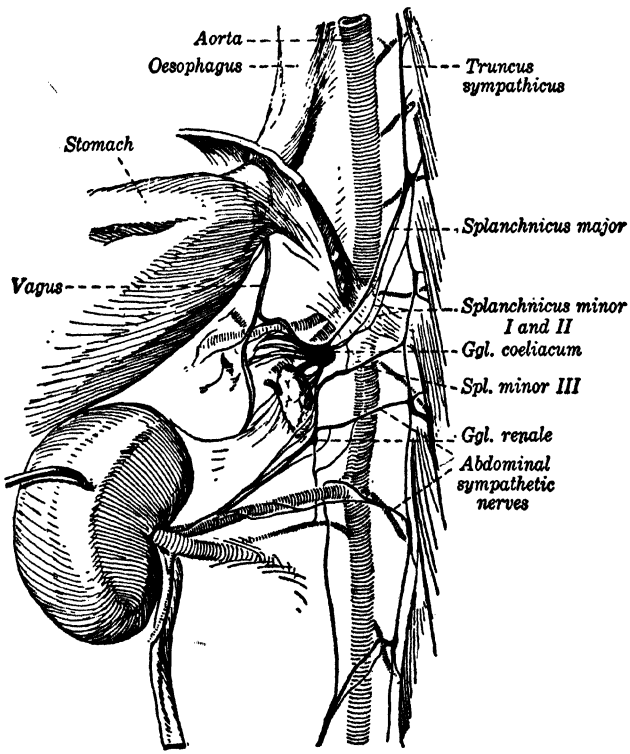

FIGURE 1.—Part of the Sympathetic Chain near the Stomach and the Diaphragm, with Nerves to the Left Kidney, which, with the stomach, is turned to the right. After Hirt, '26.

Turn the kidney with the attached peritoneum to the right (Fig. 1).

Tease away the peritoneum carefully between the stomach and the left suprarenal body, and thus expose:

1. The left Cœliac ganglion (Semilunar ganglion)

(Fig. 1), lying upon the Superior mesenteric artery. Is it connected with the right ganglion? Compare position and form in the human body (Cunningham, fig. 642, pp. 796–797).

2. Great Splanchnic nerve. Trace this from the cœliac ganglion to where it enters the diaphragm.
3. Cœliac plexus (Solar plexus), fine nerves spreading from the ganglion in various directions. To what organs are you able to trace them?

Find in the posterior part of the Mesocolon, the Inferior mesenteric artery, and by teasing away the peritoneum, the

4. Inferior mesenteric ganglion, lying upon the aorta near the origin of the artery.
5. Inferior mesenteric plexus. While dissecting arteries and veins, look for any connection with the Cœliac plexus. With the Pelvic plexus? (Botár, '32, figs. 8–10.)

Double ligate and **cut** the Adrenolumbalis artery and vein, opposite the anterior pole of the kidney.

With the seeker **tease** away the loose connective tissue in the groove between the aorta and the Psoas minor muscles, by this action exposing the

6. Truncus sympathicus, of both sides.

Trace the left trunk from the diaphragm posteriorly, taking care not to cut any nerves or blood vessels.

a. Ganglia of the trunk.
b. Branches from the ganglia.

7. Lesser splanchnic nerves, from the cœliac ganglion to the truncus sympathicus. How many? The first may enter the diaphragm. Trace it no further.

Draw an outline of the cat and on it make a diagram of the part of the autonomic system so far observed.

VII. PORTAL SYSTEM AND MESENTERIC ARTERIES

Arteries, veins, and nerves should be traced side by side. Items in parentheses in this and following sections may be omitted.

Turn the liver and stomach forward. Tease the peritoneum from the blood vessels in the mesenteries and find:

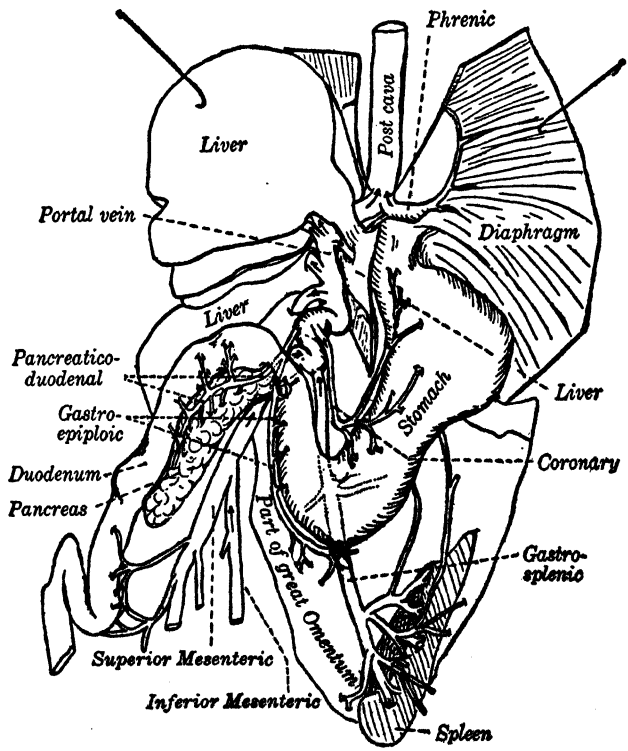

FIGURE 2.—The Stomach and the Principal Veins of the Portal System. After I. W. Wilder, '19.

1. Superior mesenteric vein (Fig. 2). Find the vein in the duodenal mesentary, and trace its Branches to the small intestine, removing the lymph glands in the way.
2. Inferior mesenteric vein, from 1 through the meso-colon to the rectum, with Branches to the colon, cæcum, and small intestine. Look for anastomoses (connections) with branches of 1.
3. Gastro-splenic vein (Fig. 2). Find where it joins 1. Pass the seeker parallel to the vein dorsal to the left lobe of the pancreas. Cut through to the seeker, and tease away the tissues covering the vein and its Branches to pancreas, spleen, and stomach.
4. Portal vein, from junction of 1 and 3 to the liver.

(5. Vena coronaria ventriculi, origin on 3 or 4, Branches to the lesser curvature.)

(6. Vena gastro-epiploica, in great omentum along greater curvature; origin with 7 from 4.)

(7. Vena pancreatico-duodenalis, on the duodenum. Anastomosis with 1.)

Draw a diagram of the portal system.

Trace with the seeker:

1. Superior mesenteric artery (Cunningham, p. 943, fig. 763).
   a. Pancreatic branches.
   b. Intestinal branches.
2. Inferior mesenteric artery (Cunningham, p. 946, fig. 764).
   Branches. How distributed? How many anastomoses with 1?
3. Cœlic artery, from the aorta, anterior to 1;—its Branches (Cunningham, p. 940, fig. 762).
   a. Lienalis, or Splenic artery.
   b. Gastrica sinistra, to the lesser curvature.

c. Hepatic artery, seen best from the right. (Branches:
1. Arteria hepatica propria, to the Liver.
2. A. pancreatico-duodenalis.
3. A. gastro-epiploica, by common stem with 2.)
The demonstration of *b* and *c* will be easier if a thread be tied around the cœliac artery near the first branch and the free end be passed out through the omental sac and held taut. If found difficult at this stage, postpone study of the cœliac artery until later, page 33.
(d. Phrenic artery, to diaphragm, usually arises from the Adrenolumbalis.)

Draw a diagram of the mesenteric arteries.

VIII. DIGESTIVE TUBE—INTESTINE

Turn the entire intestine to the left, and fasten it there.

Tease away the tissue of the right lobe of the pancreas, and find

1. Accessory pancreatic duct. Trace it forward to its junction with the
2. Pancreatic duct, from the left lobe, and follow this to the duodenum (Boyden, '25).

Trace with the seeker:

1. Common bile duct, Ductus choledochus, from its entrance into the duodenum beside the pancreatic duct, thence toward the liver parallel to the portal vein in the margin of the lesser omentum bordering the epiploic foramen of Winslow.
2. Branches of the common bile duct will be seen later, page 32 (Boyden, '25).

Remove the spleen.

Lift up the intestine and **cut** through the mesentery *close* to the intestine from the duodenum to the rectum, first ligating any vessels that may bleed. Doubly ligate the rectum in front of the bladder and the duodenum below the duct of the pancreas. **Cut** between the ligatures at each end, and **remove** the intestine.

Examine the intestine:

1. Measure its length.
2. Slit open the duodenum, wash out the contents, and examine the mucous membrane. Observe the villi. Are parasites present? (Hall, '19.)
3. Slit open the cæcum and adjacent parts of the ileum and colon. Find the ileocæcal valve. Are villi present in the ileum, in the colon? Peyer's patches?

Make a longitudinal incision along the greater curvature of the stomach from near its middle to the pylorus and continue it into the duodenum. Remove the contents of the stomach and duodenum.

Examine:

1. Pylorus, exit to duodenum.
2. Mucous membrane lining the stomach.
3. Mucous membrane of duodenum.
   In what ways do they differ?

IX. UROGENITAL SYSTEM

Remove peritoneum and fat covering the left kidney, starting from the previous incision, page 18, and taking care not to open the Capsule of the kidney or to injure the vessels or the suprarenal body.

Observe the form of the Kidney (Ren, Metanephros):

1. Lateral margin.
2. Medial margin.
3. Renal hilus.

Note the vessels entering the kidney at the hilus:

1. Renal artery.
2. Renal vein.
3. Ureter, duct of the kidney.

Trace the ureter from the kidney to the bladder, taking care not to injure the ductus deferens and blood vessels. Does it pass dorsal or ventral to any blood vessel? (McClure and Huntington, '29.) Note the relation of the ureter to the lateral ligament of the bladder.

Open the very thin Capsule of the kidney, and turn it back.

Slice away the ventral wall of the kidney to expose:

1. Substance of the kidney.
   a. Cortical (outer) layer.
   b. Medullary (inner) substance. Note the relation of visible blood vessels to these layers.
2. Pelvis (basin) of the kidney, at the hilus. What is its form? Can you pass a bristle through it into the ureter? What is its relation to the capsule?
3. Sinus of the kidney, cavity within the pelvis.
4. Papilla, portion of the medullary substance projecting into the sinus.

Make a transverse section across the middle of the kidney. What do you learn of the form of the papilla, sinus, and pelvis?

Cut the Suspensory Ligament (plica umbilicalis media) of the bladder, and dissect the fat from within the peritoneum of the Lateral Ligaments, page 17, without injuring the vessels.

Study the urinary bladder, Vesica urinaria:

1. Form and position.
2. Neck. Relation to Retrovesical excavation, page 17.

3. Blood vessels. **Make** a sketch of their distribution.
4. Openings of the ureters: **Make** a longitudinal incision in the ventral wall of the bladder as far as the neck. Find the openings within, and pass bristles from the bladder into the ureters.

Draw an outline of the cat and add outlines of the organs of this system so far as observed.

FEMALE REPRODUCTIVE ORGANS

Examine the abdominal female organs (Reighard and Jennings, fig. 112).

1. Ovaries, female gonads,—their position, form, and size. Graafian follicles (Longley, '11).
2. Oviducts:
   a. Ostium tubæ, opening into peritoneal cavity.
   b. Fallopian tube, from *a* to *c*.
   c. Uterus, the womb.
      1. Cornua uteri (horns of the uterus).
      2. Corpus uteri (body of the uterus).
      If the subject is pregnant, what is the position of the embryos? (Young embryos should be preserved carefully in 10 per cent. formalin.)
3. Attachments of the uterus.
   a. Broad ligament, along cornus uteri.
   b. Round ligament, a fold from *a* to groin.
   c. Ligament of the ovary to cornus uteri.

Slit open one horn and the anterior part of the body of the uterus. Is the body of the uterus divided?

Find: Vulva, female urogenital aperture.
Urogenital sinus within the vulva.

Make a longitudinal incision through the skin from the symphysis pubis to within a quarter of an inch of the vulva. Make a transverse cut at each end of the incision and turn back the flaps. Remove the muscles from the

ventral aspect of the pelvis on both sides enough to expose the Obturator foramen. With a strong scalpel cut through the symphysis. Grasp one of the legs firmly in each hand and bend them sharply outward. Carefully separate the underlying structures from the pelvic bone. Then with the bone forceps cut through the narrow parts of the pubis and ischium, and remove the bony fragment, taking great care not to injure the organs within the pelvis.

Cut one lateral ligament of the bladder along the uterus and on the same side dissect off M. levator ani. **Trace** blood vessels of the oviducts.

Observe the pelvic organs:

1. Corpus uteri.
2. Vagina, posterior part of oviduct.

Pass a probe through the urogenital sinus to the boundary between 1 and 2. Follow with scissors to open 2 on one side, and examine:

3. Cervix uteri, neck of the womb.
4. Orificium (Os)uteri, mouth of the womb.

Pass a probe through the neck of the bladder, and **observe:**

5. Urethra.
   a. Its external Orifice into the
6. Urogenital sinus, or Vestibule.
7. Vulva.

Add these organs to the drawing of the urogenital system.

Male Reproductive Organs

Find:

1. Penis, copulatory organ.
2. Scrotum, testicular sac.

Make a longitudinal incision through the skin and fascia exactly on the median line from the symphysis pubis

nearly to the dorsum of the penis. Carefully dissect the flap on one side only, so as to uncover the

3. Spermatic cord. Trace this to the scrotum. Note the position of inguinal lymph glands.

Dissect carefully the skin from the scrotum, and observe on each side a

4. Tunica vaginalis, enclosing a
5. Testis. Note its connection with the Spermatic cord.

Open one tunica vaginalis, and **observe**:

1. Cavity of the Scrotal sac, lined by the
2. Parietal layer of the Tunica vaginalis propria.
3. Visceral layer of the Tunica vaginalis propria covering the
4. Testis, male gonad.

Make a longitudinal incision through the parietal layer of the tunica vaginalis propria, and reflect it from the testis. With the fine scissors continue the incision along the spermatic cord, taking great care not to injure the organs within, nearly to the

1. Inguinal canal, where the spermatic cord penetrates the body-wall, and **observe** the position and connections of:—
2. Line of confluence of the parietal and visceral layers of the Spermatic cord and of the Tunica vaginalis propria testis.
3. Testis.
4. Epididymis (mesonephros).
   a. Caput epididymidis. Upon anterior end of testis.
   b. Cauda epididymidis. Curved around posterior end.
5. Vas deferens (ductus deferens, BNA). Continuous with 4*b*.
6. Spermatic artery.
7. Spermatic vein. Can you easily pass a seeker along

these vessels from the abdominal cavity through the inguinal canal into the lumen of the spermatic cord?

Dissect the abdominal muscles from the inguinal canal. Open the proximal part of the spermatic cord and without cutting anything more trace 5 to the retrovesical excavation, and 6 and 7 to their sources.

Dissect the skin from the dorsum of the penis.

Observe:

1. Prepuce (terminal fold of skin).
2. Glans penis, covered by the prepuce.
3. External (urogenital) orifice of the urethra.

Cut exactly in the median line through the muscles to the mid-ventral surface of the pelvis, separate the muscles from the bone a short distance on each side, and with a strong scalpel cut through the cartilage of the symphysis pubis. Take the legs, one in each hand, and bend them sharply outward. Dissect the muscles from one side of the pelvis so as to expose the Obturator foramen, page 8. Remove all the skin from the penis and **find:**

4. Crura of the penis, attached to the ischium on each side.

Cut the crus on the dissected side, and the Levator ani muscle (Bradley, '27, fig. 46) on the inner side of the pelvis. Cut with bone forceps through the narrow parts of the ischium and the pubis, remove the fragments of bone, taking care not to injure the pelvic organs, and **find:**

5. Urethra, trace it from the neck of the bladder to the penis.
6. Prostate gland, at the beginning of the urethra.
7. Vasa deferentia. Where do they enter the urethra? Note relations to the peritoneum.

Add these organs to your diagram of the urogenital system.

X. THORACIC VISCERA

Reflect the Rectus abdominis muscles, and on the inner side **trace:**

Superior epigastric artery and vein to where they emerge from between ribs, on both sides of the thorax.

Ligate and **cut** the Vasa[1] thoracica longa beneath the Pectoralis major of both sides, page 13. **Dissect** the muscles from the ventral part of the thorax on both sides so as to expose the sternum and the costal cartilages. With strong, round-pointed scissors make a longitudinal incision through the body-wall about *half an inch* from the median line on the left side of the sternum lateral to the epigastric vessels from the diaphragm through the first rib, being very careful not to cut the axillary vessels or anything in front of the first rib. With the finger locate the sternocostal part of the diaphragm, then cut it on the left side close by the ribs to a point near where the great splanchnic nerve penetrates it. Enlarge the opening into the thorax by cutting with bone forceps through the ribs on the left side, working from the inside and taking great care when cutting the first rib not to injure adjacent parts. Do not cut the muscles, but turn the flap to the left and fasten it there with hooks.

Observe:

1. Thoracic cavity (left pleural sac).
2. Left lung (Pulmo), its lobes; its Hilus and root (Cunningham, fig. 870), apex, base.
3. Pleura.
   a. Parietal part covering ribs and diaphragm.
   b. Pulmonary part covering the lung.

[1] Vasa (pl. of vas) = vessels, *i.e.* artery and vein.

c. Mediastinal septum, dividing the thoracic cavity into right and left halves.

Open the right pleural sac by cutting through the body-wall on the right side of the sternum, using the same procedure as for the left side. Do not cut the mediastinum.

Locate the position of:

4. Heart.
5. Œsophagus.
6. Aorta.

Observe:

7. Right lung, its lobes.
8. Inferior vena cava in a fold of the mediastinal pleura extending from the diaphragm to the heart.
9. Infracardiac space containing a lobe of the lung. This may be found by passing the finger around the dorsal side of the vena cava.
10. Superior vena cava, anterior to heart.

Examine muscles attached to the Manubrium (3*b*, page 34), and on the inner side of the sternum and in the anterior part of the Mediastinal septum find the Internal mammary arteries and veins. Thymus gland, if present.

Ligate these vessels near the sternum. **Cut** through the mediastinum close to the sternum, and remove the latter.

Examine the

11. Diaphragm.
    a. Tendinous portion (Semilunar tendon).
    b. Muscular portion. Determine accurately the origin and insertion of the muscle fibres in each part.
        1. Lumbar part, Crura.
        2. Sternocostal part.

Trace:

12. Left phrenic nerve,—from the root of the lung to the diaphragm.
13. Right phrenic nerve. Is its course the same as on the left side?

XI. THE LIVER AND THE STOMACH

Study the liver, Hepar.

1. Its relation to the peritoneum:
   a. Serous coat.
   b. Lesser omentum, gastro-hepatic.
   c. Coronary ligament, to diaphragm.
   d. Falciform ligament, to ventral mid-line.
2. Divisions of the liver:
   a. Two main divisions separated by the falciform ligament and the umbilical notch.
   (b. Lobes in each division, how many?)
3. Gall bladder, Vesica fellea.

Slice away the lobes of the liver, avoiding the gall bladder, so as to expose,—

4. Porta hepatis, the door of the liver.
5. Vessels entering the porta. Trace their connections.
   a. Common bile duct, Ductus choledochus.
   b. Portal vein.
   c. Hepatic artery (A. hepatica propria).
6. Foramen of Winslow (Foramen epiploicum), a passage, bounded ventrally by the hepatic artery, from the right peritoneal cavity into the omental sac. Resemblance to infracardiac space (Mall, '10; Broman, '11).

Continue to remove slices of liver to expose,—

7. Branches of ductus choledochus:
   a. Cystic duct from gall bladder.

b. Hepatic ducts from the lobes (Bradley, fig. 28).

Ligate the vessels at the porta, and cut anterior to the ligature. Continue slicing and breaking the liver with the seeker, with care not to injure the vena cava, and **find:**

8. Hepatic veins from liver to vena cava inferior.
9. Phrenic veins, in diaphragm (Fig. 2).

Turn the stomach forward so as to expose its dorsal surface, and **study:**

1. Stomach, its form and connections.
   a. Wide part, Fundus, beginning anteriorly at the
   b. Cardia, junction with the œsophagus.
   c. Narrow Pyloric canal, ending at the
   d. Pylorus, junction with the duodenum.
   e. Greater curvature, with attachment of the greater omentum, which is continuous with the
   f. Mesogaster at the cardiac end.
   g. Lesser curvature, attachment of lesser omentum.
2. Cœliac artery, from the aorta near the superior mesenteric. Its branches and their relations to the curvatures of the stomach (Bradley, fig. 17):
   a. Gastro-splenic.
   b. Gastrica sinistra.
   c. Hepatic.
3. Veins, their connections (Bradley, fig. 18):
   a. Branches of the Gastro-splenic.
   b. Branches of the Portal.

Tease away the rest of the pancreas, and trace

(4. Pancreatic ducts.)

5. Vasa pancreatico-duodenales, their relation to the
6. Vasa gastro-epiploica and to the portal vein.

Make a drawing of the stomach to show these relations, and add the vessels to the diagrams made previously.

XII. DISSECTION OF THE NECK— VENTRAL ASPECT

Make a longitudinal incision through the skin on the mid-ventral line from the sternum to the larynx, thence a lateral one to the occiput, posterior to the left ear, taking great care not to injure the

1. Transverse vein.

Reflect the skin on the left side of the neck to the dorsal mid-line, and find

2. External jugular vein.

Dissect from their origins any of the Pectoral muscles that remain intact on the left side of the body.

Observe the origin, insertion, and relations of the

3. Muscles of the neck (Bradley, fig. 50):
   a. Clavotrapezius, a flat muscle on the side of the neck from the clavicle to the apex of the occipital bone and median line (Lig. nuchæ) of the neck.
   b. Sternomastoid,—(1) thick posterior part from manubrium, (2) thin anterior part from mid-ventral line of neck; both together to the mastoid process. Crossed by the External jugular vein and the 2nd Cervical nerve.

Cut along the median line through the origin of the Sternomastoid and find:

   c. Pair of Sternohyoid muscles (from 1st costal cartilage to hyoid bone). **Separate** the pair and **cut** the left muscle. Under it find,—
   d. Sternothyroid (from 1st costal cartilage to thyroid cartilage of larynx). **Cut** this muscle.

Cut the Clavotrapezius and **trace** the left External jugular vein to it junction with the

4. Left Subclavian vein, to form the

5. Left Vena anonyma (Innominate vein, Fig. 4).

Observe:

6. Trachea. Its cartilaginous rings. Inferior thyroid artery and vein, with Recurrent nerve, lengthwise on its ventral surface. On its left side **find:**
7. Thyroid gland. Left lateral lobe near the larynx. Isthmus, narrow strip across the trachea.
8. Parathyroid glands. Whitish spots on the thyroid. Nicholas and Swingle, '25, pls. 1, 3.)
9. Left Common carotid artery.
10. Left Vagus nerve, Xth Cranial, closely bound with
11. Sympathetic nerve trunk.
12. Internal jugular vein. (Rarely injected.) Trace the vein to its junction with the External jugular.

Find near the 1st rib,—

13. Left subclavian artery.

XIII. AUTONOMIC NERVOUS SYSTEM—THE VAGI AND THE CERVICAL AND THORACIC SYMPATHETIC

Turn the left lung forward or to the right, and fasten it there with hooks, so as to expose the dorsal part of the left pleural sac.

Trace:

1. Sympathetic nerve trunk from where observed in the abdomen to the
2. Stellate ganglion = 1st Thoracic + Inferior cervical, near the head of the first rib (Fig. 3). The nerve trunk may be found by teasing away the pleura to the left of the aorta.
3. Great splanchnic nerve. Trace it from the cœliac ganglion to the sympathetic trunk.

(4. Lesser splanchnic nerves.)
(5. Thoracic ganglia. How many?)
(6. Rami communicantes. From thoracic ganglia to spinal nerves. To be seen in the triangle between the medial edge of an intercostal muscle and the rib anterior to it.)

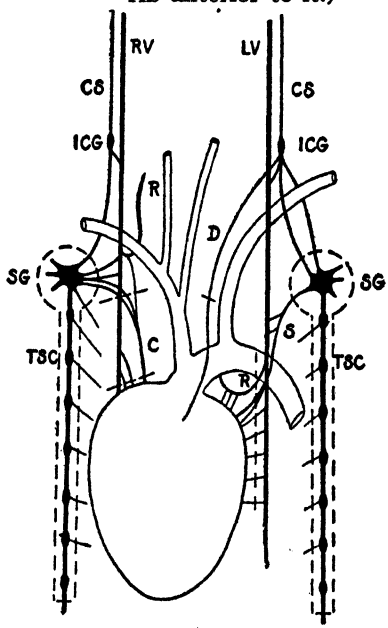

FIGURE 3.—Diagram of the usual Arrangement of Cardiac Nerves in the Cat. RV, right vagus; LV, left vagus; CS, cervical sympathetic chain; ICG, middle cervical ganglion; R, recurrent laryngeal nerve; SG, stellate ganglion; C, "common cardiac nerve;" S, sympathetic fibres; TSC, thoracic sympathetic chain. The dash lines indicate the parts cut in order to denervate the heart. After Cannon, Lewis, and Britton, '26.

Double ligate and cut the Internal mammary artery, and the Innominate vein where it lies over the left Carotid artery.

Trace the sympathetic trunk around the Subclavian artery to

7. Middle cervical ganglion (ICG, Fig. 3), where vagus and sympathetic join (Laubmann, '31, fig. 1).

Cut through the diaphragm to the œsophagus. On the mediastinum, parallel with the subclavian artery, find:

8. Left vagus nerve. Trace it from the neck to the stomach. Look for branches and the connections with the sympathetic.

Trace in the same way:

9. Right vagus. Is this connected with the left vagus? How many gastric branches?
10. Right sympathetic trunk.

Trace the united vagus and sympathetic trunks forward on one side to the cranium and find:

11. Ganglion nodosum on the vagus.
12. Superior cervical ganglion on the sympathetic. These may appear as one ganglion.

Add all of these nerves to the diagram of the autonomic nervous system.

XIV. SUPERIOR VENA CAVA AND ITS BRANCHES

Tear away part of the mediastinal septum, and observe: Contents of Mediastinal cavity.

a. Thymus gland.
b. Pericardium. **Inflate** it. **Open** it and note where it joins the Epicardium, serous coat of the heart. Is the pericardium connected with the diaphragm? Compare with human anatomy.

Remove the thymus gland and the pericardium without cutting any vessels.

Examine:

1. Heart (Bradley, figs. 23, 24).
   a. Atrial auricles, right and left.
   b. Coronary groove, Sulcus coronatus.
   c. Ventricles, right and left, separated by
   d. Ventral and dorsal longitudinal grooves.
2. Great blood vessels. Find where each one leaves or enters the heart.

a. Pulmonary artery from right ventricle.
b. Aorta.
c. Pulmonary veins, with arterial blood from lungs. How many?

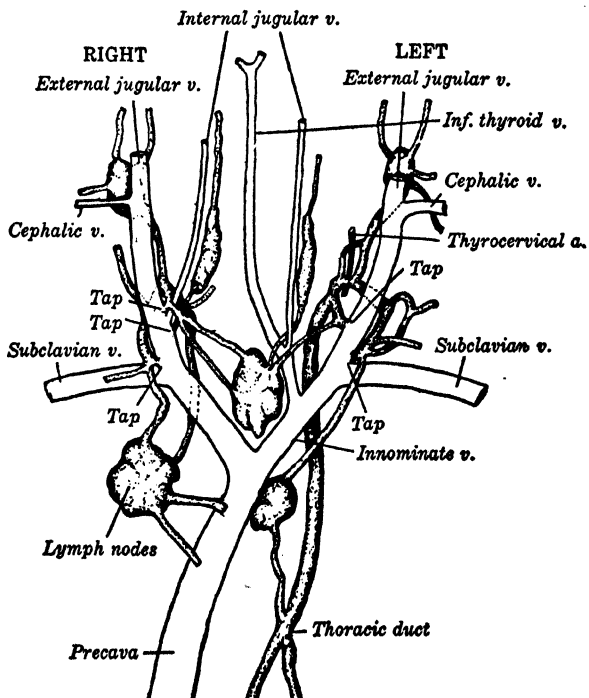

FIGURE 4.—Anterior Branches of the Superior Vena Cava (Precava) and the connecting Lymphatic Vessels. *Tap*, lymphatic opening into a vein. Note the distribution of the taps ("Type I") and the abnormal origin of the left internal jugular vein. After McClure and Silvester, '09.

d. Inferior vena cava. Observe its course from the diaphragm to the heart.
e. Superior vena cava.

Ligate and **cut** the inferior vena cava close to the diaphragm and at the Porta.

Remove diaphragm, liver, and stomach from the body.

Trace the branches of the superior vena cava (Precava, Fig. 4):

1. Azygos vein. Its branches:
   a. Intercostal veins. Are they paired?
2. Sternal vein, dividing into right and left.
   a. Internal mammary veins.
3. Innominate veins. Trace the branches of the left innominate vein.
   (a. Inferior thyroid. Hunt, '19, figs. 1–7.)
   (b. Vertebral.)
   (c. Costocervical, usually united with the vertebral.)
   d. Subclavian, which after passing through the wall of the thorax becomes the
      1. Axillary vein, and divides into
      2. Subscapular and
      3. Brachial.
   e. External jugular vein. Its branches:
      1. Internal jugular.
         (a) Lymphatic vessels, if filled, may be seen to enter the vein here, at *d*, or at both places (Huntington and McClure, '10, figs. 1–3), and to connect with
         (b) Thoracic duct, which may be traced by carefully teasing the pleura on the left side of the aorta.
      2. Vena transversa scapulæ, V. cephalica, to the shoulder.
      3. Posterior facial vein.
      4. Anterior facial vein.
      5. Vena transversa to the right external jugular.

Draw an outline of the cat. Make on it a diagram of the precava showing the relation of its branches to other structures.

XV. INFERIOR VENA CAVA AND ITS BRANCHES

Remove the urinary bladder and the female reproductive organs, first ligating the vessels. Leave the kidneys and ureters in place. Carefully dissect out the rectum. Clear away the peritoneum from the dorsal wall of the abdomen, using the seeker and taking great care not to injure any other vessels or the spinal nerves. While doing this look for connections of the sympathetic nerves.

Find:

1. Vena cava inferior, postcava. Trace it from the heart to the pelvis, noting its relation to the mid-line of the body, to the aorta, and to the ureters.
2. Its Branches. Their arrangement presents four types of variation. Type B is the most frequent (McClure and Huntington, '29, pl. 18). *a* and *b* have been seen and excised, pages 33 and 39.
   a. Phrenic veins, in the diaphragm.
   b. Hepatic veins, from the liver. How many?
   c. Adrenolumbalis veins, from the suprarenal bodies and abdominal wall.
   d. Renal veins, their positions and relations. How many from each kidney?
   e. Gonadial { Spermatic in the male / Ovarian in the female }. Are these veins symmetrical? Note relation of each to *d* and to ureter.
   f. Lumbar veins, on dorsal side of postcava from muscles of the back.

g. Iliolumbalis veins, across the psoas muscles from the lumbar region.

h. Common iliac veins, terminal fork of the postcava.

Add a diagram of the postcava and its branches to the outline made previously.

XVI. THE AORTA AND ITS BRANCHES

Trace: the Aorta from where it leaves the heart to the pelvis, and its branches:

1. Innominate artery, giving off the
   a. Mediastinal artery, and then dividing into
   b. Left common carotid artery,
   c. Right common carotid artery, and
   d. Right subclavian artery.

(2. Ligamentum arteriosum, opposite 1, vestige of fetal artery connecting Pulmonary artery. Coulter, '09, fig. 12.)

3. Left subclavian artery.
4. Intercostal arteries. Are they paired?
5. Bronchial arteries to the lungs.
6. Œsophageal arteries.
7. Cœliac artery.
8. Superior mesenteric artery.
9. Adrenolumbalis and its Phrenic branch. Paired?
10. Renal, to each kidney.
11. Gonadial { Spermatic, in the male / Ovarian, in the female } both sides.
12. Inferior mesenteric artery.
13. Iliolumbalis, across the psoas muscles on each side.
14. Lumbar, from the dorsal side of the aorta to the muscles of the back. How many? Are they paired?

15. External iliac, a large artery covering the iliac vein on each side to the groin.

Draw an outline of the cat and represent the aorta and its branches so far as traced. Indicate the organ supplied by each artery.

XVII. BLOOD VESSELS OF THE PELVIC REGION AND THE THIGH

Trace the arteries and veins together, noting any accompanying lymphatic or nerve (N) and relation to muscles (M).

1. External iliac artery.
2. Common iliac vein, branching into Hypogastric (4) and External iliac vein.
3. Femoralis, continuation of the External iliacs from the body-wall along the medial surface of the thigh with N. saphenus. Proximal branches:
   a. Profunda femoris, largest, posterior, near Os pubis, under M. pectineus (Bradley, figs. 33, 47).
   b. Branches of or near *a*.
      1. Superficial epigastric, to superficial fascia of abdomen, page 11.
      2. Inferior epigastric, to inner side of M. rectus abdominis.
      3. Branch to ligaments of bladder.
   c. Circumflexa femoris lateralis, anterior, under M. sartorius.
   d. Femoris anterior, origin with *c*, distally beside N. femoralis.
4. Hypogastric (Internal iliac), branches to bladder, rectum, and genital organs.

5. Sacralis media,—artery, continuation of aorta; vein from 2. Symmetrical? Both to tail as
6. Caudal.

Add these arteries and veins to the previous diagrams.

XVIII. THE HEART (Cor)

Cut the azygos vein, the superior vena cava anterior to it, the arch of the aorta, and the arteries entering it. Then, working backward, carefully dissect the heart free from the lungs, cutting the connecting vessels and leaving the lungs in place. Remove the heart from the body and put it into a pan of water.

Clear away carefully all loose tissue adhering to the vessels.

Identify:

1. Great blood vessels entering the heart, pages 37–38.
2. Intrinsic vessels of the heart (Sobotta, II. p. 469):
   a. Left coronary artery.
   b. Right coronary artery.
   c. Venæ cordis:
      1. Vena cordis magna (coronary sinus) in the coronary groove under the epicardium near vena cava inferior.
      2. Smaller veins of the heart.

Make two incisions,—*a.* from the entrance of the precava to the entrance of the postcava; *b.* from the middle of *a* to the tip of the right auricle (ear-like appendage of 3). Wash out and **examine:**

3. Right atrium.
   a. Inner surface.
   b. Openings of the venæ cavæ.
   c. Atrio-ventricular aperture.
   d. Coronary sinus and opening of Vena cordis magna.

Make two incisions,—*a.* along the posterior wall of the pulmonary artery and across the right ventricle, not deeper than its wall, about 5 mm. from the coronary groove; *b.* from the pulmonary artery parallel with the ventral longitudinal groove on the right of it. Wash out and **examine:**

4. Right ventricle.
   a. Wall of the ventricle. Note its thickness.
   b. Inner surface.
   c. Cordæ tendineæ and Columnæ carneæ.
   d. Tricuspid valve.
   e. Conus arteriosus, separated by
   f. Semilunar valves from the pulmonary artery.
   g. Left and right branches of the pulmonary artery.

Cut through the wall of the left atrium, parallel with the coronary sinus, from near the postcava to the tip of the auricle, and **examine:**

5. Left atrium.
   a. Openings of the Pulmonary veins. How many?
   b. Atrial septum.
   c. Left atrio-ventricular aperture.

Slit the ventral side of the aorta from the innominate artery toward the heart, and continue the incision across the pulmonary artery and around the apex of the heart on the left of both longitudinal grooves. **Observe:**

6. Left ventricle.
   a. Wall. Its thickness compared with the right ventricle.
   b. Inner surface.
   c. Interventricular septum.
   d. Cordæ tendineæ.
   e. Bicuspid, or mitral, valve.
   f. Semilunar valves of the aorta.

g. Openings of the coronary arteries. Relation to valves.

Draw a diagram of the heart and a cross section of the ventricles.

XIX. SALIVARY GLANDS

Remove the skin and superficial muscles (Reighard and Jennings, fig. 64) from one side of the head.

Observe:

1. M. masseter, the large adductor muscle of the jaw.
2. Two Lymph glands near the junction of the anterior and posterior facial veins, page 39.
3. Parotid gland, immediately below the ear (Mivart, fig. 88).
4. Parotid duct (Steno's duct). Trace it across M. masseter from the anterior border of the gland to its opening into the mouth opposite the last premolar tooth.

Remove the facial vein and lymph glands covering the submaxillary gland and clean its outer surface, and **observe:**

5. Submaxillary gland.
6. Submaxillary duct (Wharton's duct). Its origin may be found by raising the gland and examining its inner surface.
7. Sublingual gland, parallel with Wharton's duct and apparently continuous with the submaxillary gland.
8. M. digastricus, parallel to mandible.
9. M. mylohyoideus, transverse between mandibles.

Cut 8 and 9. Turn them back, and **trace** the ducts of both glands to the openings in the floor of the mouth.

Draw a diagram of the salivary glands.

XX. ARTERIES OF THE HEAD AND NECK

Dissect off the left facial veins, parotid and submaxillary glands, and the lymph gland at the side of the larynx.

Trace from the thorax into the head the

1. Left common carotid artery, and its branches (Fig. 5):

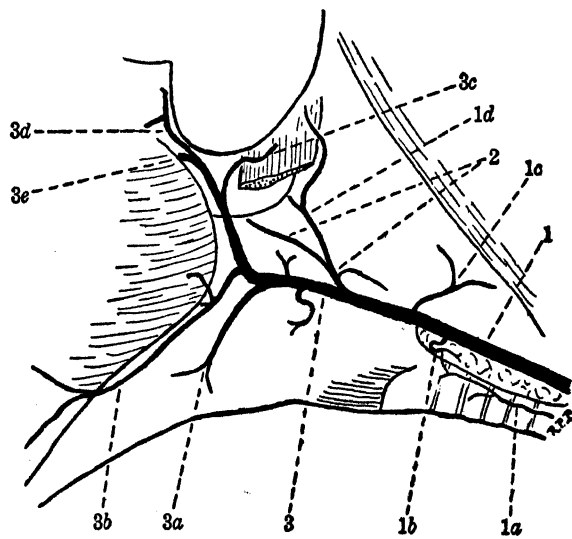

FIGURE 5.—Branches of the Left Common Carotid Artery, natural size. The numbers and letters refer to paragraphs and items in the text.

(a. Inferior thyroid, small, along the trachea.)
(b. Superior thyroid to thyroid gland and larynx.)
(c. Muscular branches.)
d. A. occipitalis, near or from 2, across M. digastricus to the back of the head.

2. Internal carotid artery, small, by the Auditory bulla with a vein to the brain.

3. External carotid artery, and its branches:
   a. Lingual artery, accompanied by the Hypoglossal nerve, XIIth Cranial, to the tongue.
   b. External maxillary artery, or Facial artery, to submaxillary gland and ventral part of jaw.
   (c. Posterior auricular behind the ear.)
   (d. Superficial temporal to the forehead.)
   e. Internal maxillary artery, to inner side of mandible below the ear.

Add these arteries to the diagram of the arterial system.

XXI. MOUTH AND PHARYNX

Remove the masseter muscle and the posterior end of the zygomatic arch, also M. temporalis from the coronoid process of the mandible and from the temporal fossa. Cut with the bone forceps through the mandible between the first premolar and the canine tooth. Disarticulate the mandible, cut through the cheek and floor of the mouth parallel to the inner border of the mandible, and remove the mandible with the parts attached to it.

Observe:

1. Mouth cavity (Cavum oris).
2. Mucous membrane lining the cavity.
3. Teeth and gums.
4. Lips and cheeks.
5. Tongue.
6. Palate, roof of mouth.

Separate the hyoid bone from the auditory bulla and make a longitudinal incision through the lateral wall of the pharynx, and **observe:**

7. Isthmus faucium, passage from mouth into the pharynx.
8. Pharynx proper, separated by the soft palate from the
9. Nasopharynx, and from the mouth by the
10. Pillars of the fauces, in which lie the
11. Tonsils.
12. Opening into the Œsophagus.
13. Epiglottis and opening into the Larynx.

Slit the soft palate lengthwise, and observe:

14. Openings into the Nasopharynx:
    a. Choanæ, or Posterior Nares, from the nose.
    b. Eustachian tubes, from the ears. Are either of these structures represented in the Dogfish? In the Frog?

Turn the larynx, trachea, and lungs to one side, and without disturbing them further trace the

15. Œsophagus from the pharynx to the diaphragm. Slit open the œsophagus on one side, and notice character of the mucosa.

XXII. RESPIRATORY ORGANS

Cut off the end of the Snout, and observe:

1. Nasal cavity (Lucas and Douglas, '34, figs. 2A and 9).
2. Nasal septum.
3. Mucous membrane.

Pass a probe through the nasal cavity. Where does it emerge?

Insert a blow pipe into the trachea, and inflate the lungs. Where the blow pipe was inserted cut through the trachea and œsophagus, then separate the adjacent structures so

as to remove in one piece the tongue, hyoid bone, larynx, and the anterior parts of the trachea and œsophagus. Carefully separate the larynx from the pharynx, and study the

4. Muscles of the larynx (Bradley, figs. 68, 69).
5. Cartilages of the larynx.

Make a longitudinal incision through the larynx, and **observe:**

6. Cavity of the larynx (Kurz, '26, fig. 11).
7. False vocal cords, plicæ ventriculares.
8. True vocal cords, plicæ vocales.
9. Glottis, passage from the pharynx.

Cut through the pulmonary ligaments, remove the trachea and lungs from the body, and **observe:**

10. The Trachea:
    a. The tracheal cartilages, their shape.
    b. Lining of ciliated epithelium.
11. The Bronchi. How many? Their branches?
12. Lungs. How connected? How many lobes in each?

Make a diagram of the whole respiratory apparatus.

XXIII. MUSCLES AND SPINAL NERVES

Find the phrenic nerve and trace it to the axilla.

Remove the œsophagus and large vessels from neck and thorax. **Find:**

1. M. longus coli upon the vertebræ, thoracic and cervical parts.
2. M. longus capitis, forming a ridge on each side of the first pair.
3. Cervical nerves II–V, emerging between fibres of 2 (Bradley, fig. 51).

4. Brachial plexus, Cervical N.V–VIII and Thoracic N.I and II, near 1st rib (Bradley, fig. 2).
5. Roots of phrenic nerve.

Find and trace both ways:

6. An Intercostal nerve, near posterior border of a rib.
7. 1st Lumbar nerve.

Remove both kidneys, the rectum, and aorta; clean the muscles, and **observe**:

8. Psoas muscles (tenderloin), each side of median line.
   a. M. psoas minor.
   b. M. iliopsoas, extending to femur.
9. Nerves of Lumbo-sacral plexus (Bradley, fig. 48).
   a. N. femoralis at the groin from between fibres of 8 *b*; its branch, N. saphenus, to A. femoralis.
   b. N. obturatorius from medial side of 8 *b*.
   c. N. ischiadicus, Great Sciatic nerve, medial to 9 *b*.
   d. N. pudendus, lateral to M. levator ani.

Cut muscle between nerves and **trace** their connections.

Remove skin and fascia from Hip and Thigh. **Study** the muscles and nerves (Reighard and Jennings, pp. 186–203, 395–401):

1. M. gracilis, posterior medial aspect of thigh.
2. M. sartorius, anterior medial.
3. N. saphenus, along A. femoralis.

Cut across 2, and turn back both ends.

4. M. quadriceps femoris, four muscles on front of thigh, inserted together on Patella.
5. N. femoralis on inner side of 4.
6. Gluteus group, rump muscles, from sacrum and pelvis to femur.
7. M. caudofemoralis, from base of tail.
8. M. biceps femoris, posterior lateral, large.
9. M. semitendinosus, posterior to 8.

Separate 7 and 8 near origin. **Cut** 8. **Trace** both ways:

10. N. ischiadicus (Reighard and Jennings, fig. 163).

(11. Other muscles and nerves.)

Make sketches to show relations of muscles, nerves, and blood vessels.

Remove all skin from the body. **Study** the dorsal Extrinsic muscles of the Fore Limb:

1. Trapezius group, three muscles (including M. clavotrapezius, page 34) from the dorsal mid-line to the clavicle and the spine of the scapula.

Cut these near origin, and under them **find**:

2. Rhomboideus group, three muscles from the occipital bone and dorsal mid-line to the vertebral border of the scapula.
3. M. levator scapulæ ventralis (= omotransversarius) from the wing of the atlas to the spine of the scapula. On its dorsal border **find**
4. N. accessorius, Cranial XI, trace it both ways.
5. Origin of M. latissimus dorsi.

Cut 3, sever the axillary nerves and vessels, bend the arm outward, and **observe** the full extent of

6. M. serratus anterior (ventralis) from vertebral border of scapula to the ribs.
7. M. scalenus from neck to ribs, page 14.

Cut M. serratus anterior, latissimus dorsi, rhomboideus, and remove the limb. (**Study**

8. Intrinsic muscles of shoulder and upper arm. Reighard and Jennings, p. 156–172.)

Remove all cut muscles on the dorsal surface from the occiput to the root of the tail. **Study** the Dorsal muscles of the Trunk and Neck:

1. M. serratus posterior (dorsalis) from aponeurosis on the mid-line to ribs.
2. M. splenius, triangular, on neck from spinal processes to occipital bone.

Remove 1 and 2.

3. M. longissimus dorsi, large, longitudinal in the groove between spinal and transverse processes of the vertebræ. In the lumbar region, medial and lateral divisions; anterior to 1st rib, divided into three muscles.
4. Deep layer, interspinal muscles, etc.

Make lists of all the muscles that have been seen: (1) superficial, (2) mandibular, (3) hyoidal and throat; (4) neck and trunk, *a.* dorsal, *b.* ventral; (5) fore limb, *a.* extrinsic, *b.* intrinsic; (6) hind limb.

XXIV. THE EYE

Observe the

1. Eyelids.
2. Nictitating membrane, Third eyelid.
3. Conjunctiva lining the eyelids and covering the exposed part of the
4. Eyeball.
5. Cornea, transparent, through which see the
6. Iris and its aperture, the
7. Pupil.

Cut away the eyelids and lateral wall of the orbit.

Observe:

8. Muscles of the orbit (Bradley, figs. 70, 71):
   a. Inferior oblique.
   b. External rectus.
   c. Retractor oculi (two of the four heads).
   d. Inferior rectus.
   e. Superior rectus.
   f. Superior oblique. Trace its origin.

Cut the tendon of the superior oblique, and **find** the
g. Internal rectus.

Pull the eyeball forward and **cut** the muscles and optic nerve as close to the bone as possible. **Dissect** the fat away from the eyeball, and

Observe:

Insertions of the muscles.

Point of entrance of the optic nerve.

Make a diagram showing the relations of the eyeball and its muscles.

Remove the muscles and **make an incision** through the coats of the eye from the optic nerve to the centre of the cornea. Make another meridianal incision 90 degrees from the first and remove the quadrant.

(The other eye may be removed in a similar manner and after removal cut in two by an equatorial incision.)

Place the eye in a pan of water, and **study:**

9. Coats of the Eye.
   a. Sclerotic. What is its relation to the
      1. Cornea?
   b. Choroid, pigmented, including the
      1. Iris.
      2. Ciliary body, with its folds, Plicæ ciliares.
   c. Retina, its connection with the
      1. Optic nerve at the
         Blind spot.
10. Contents of the Eye:
   a. Crystalline lens, covered by its Capsule, attached to the Ciliary body by the Zonula ciliaris.
   b. Aqueous humor, liquid filling the anterior and posterior chambers of the eye, separated by the Iris and communicating through the Pupil.
   c. Vitreous body, gelatinous, lying between the Lens and the Retina.

Make a diagram of the eye showing the relations of these parts.

XXV. THE SPINAL CORD

With the subject in the prone position, **dissect** away the muscles from the neural arches from the third cervical to the eighth thoracic vertebra. With the bone forceps remove the neural arch of one of the last cervical vertebræ, and find and isolate for a short distance the spinal nerve passing through the intervertebral foramen. Continue forward, removing the neural arches and isolating the nerves. The ganglion of the 2nd nerve will be found among the muscles dorsal to the Atlas and the Axis. Turn back the muscles and remove the arch of the Axis. Then continue the dissection posteriorly until the whole spinal cord and the roots of the nerves have been uncovered.

Observe:

1. Spinal cord.
2. Cervical and lumbar enlargements.
3. Cauda equina, posterior nerve roots.
4. Meninges:
   a. Dura mater, slit it open and reflect it for an inch or two.
   b. Subdural cavity.
   c. Pia mater, closely adherent to the cord.

Cut through the cord where the meninges have been removed, and in the section **observe:**

1. Gray and white matter (Bradley, fig. 72).
2. Fissures and grooves.

Study:

1. The Spinal nerves; how many?
2. Dorsal and ventral roots; which bear ganglia?

3. Manner of exit from the Vertebral canal.

(Follow one of the thoracic nerves to its

4. Branches:
   a. Ramus dorsalis.
   b. Ramus ventralis.
   c. Ramus communicans; with what does this connect? See page 36.)

XXVI. THE BRAIN (Encephalon)

Before removing the brain review the anatomy of the Cranium, with the aid of a divided skull, noting especially the

1. Occipital bone.
2. Parietal bones.
3. Frontal bones.
4. Temporal bones.
5. Zygomatic arch.
6. Tentorium.
7. Cribriform plate of the Ethmoid bone.
8. Sella turcica, and the
9. Foramina.

Skin the head (which may be separated from the body by severing the neck near the trunk), remove the zygomatic arch and the contents of the orbit on both sides, and cut away all muscles attached to the cranium. The lower jaw may also be removed. With a fine saw cut across the anterior ends of the frontal bones into the nasal cavity. Make a small opening in the parietal bone *without* cutting the dura mater. With the seeker separate the dura from the bone, and then with the bone forceps chip away the bone until the whole dorsal surface of the brain is exposed as far back as the tentorium. Remove the arch of the atlas. Very carefully insert the

point of the bone forceps into the foramen magnum and chip away the roof of the cranium, without injuring the dura mater, forward to the tentorium.

Observe:

1. Dorsal surface of the Brain,
   a. Its divisions:
      1. Hemispheres of the Cerebrum.
      2. Cerebellum.
      3. Medulla oblongata, continuous with Spinal cord.
   b. Meninges (coverings) of the brain:
      1. Dura mater, lining the skull and extending inward between the cerebral hemispheres, forming the Falx cerebri; also following the tentorium between the cerebrum and the cerebellum. Cut the dura on each side of the falx, reflect it, and observe the

(*2.* Arachnoid, difficult to see in gross dissection.)

3. Pia mater, upon the brain.

Carefully separate the dura from the tentorium, cut through the latter on each side and remove it. Carefully dissect out the falx and tentorial dura, taking *great pains* not to tear away the Pineal body with it. Remove the dura from the dorsal surface of the cerebrum and cerebellum.

Continue to chip away one side of the cranium, removing the dura, until one side of the brain is fully exposed.

If the brain is soft, prepare a dish containing an alcohol-formaldehyde mixture and some absorbent cotton in the bottom. Holding the head sidewise over the dish, carefully separate the olfactory bulbs from the cribriform plate by cutting the fibres of the (I) Olfactory nerves. Then beginning at the foramen magnum, tilt the brain outward very gently with the handle of the scalpel, and

with fine scissors cut in succession each Cranial nerve on one side of the brain as near its foramen as possible. Find and cut the two (VI) Abducens nerves attached to the anterior ventral side of the Medulla near the median line. Carefully dislodge the Hypophysis from the sella turcica. Then turn the brain over, cut the nerves in the same way from behind forward on the other side, and let the brain fall upon the cotton in the dish. Preserve the floor of the cranium for the study of the cranial nerves.

If the specimen has been injected, observe the Blood vessels of the brain (Bradley, fig. 75).

Remove the remaining parts of the dura mater, cutting carefully the adhesions around the nerves. Be careful not to disturb the pia mater on the dorsal side of the medulla; elsewhere it may be removed where not adherent to the brain.

Study:

2. Dorsal and lateral Surfaces of the Brain:
   a. Cerebrum, forebrain:
      1. Hemispheres, separated by the
      2. Sagittal fissure.
      3. Gyri, ridges.
      4. Sulci, grooves (Bradley, figs. 76. 77).
         (a) S. cruciatus (Langworthy, '27; Bard, '33; Huber, '34).
      5. Fissure of Sylvius, separating the
      6. Frontal lobe from the
      7. Temporal lobe, united posteriorly in the
      8. Occipital lobe.
      9. Olfactory bulbs, at the anterior ends of the Hemispheres.
   b. Cerebellum;
      1. Gyri and Sulci.

2. Vermis, median.
3. Hemispheres, lateral.

c. Medulla oblongata, hindbrain;
1. Dorsal sulcus.
2. Corpus restiforme, on each side.

Draw the dorsal surface of the brain. **Compare** with human brain (Sobotta, '32, III, pp. 651–730).

Study the ventral surface:

1. Medulla oblongata;
   a. Ventral fissure, median.
   b. Pyramidal tracts, a white band each side of *a*.
2. Pons, transverse fibres.
3. Pedunculi cerebri (Crura cerebri), midbrain.
4. Hypophysis, posterior to
5. Optic chiasma, where the Optic nerves pass into the Optic tracts, white bands.
6. Olfactory tracts, a band of white matter on each side connecting the
7. Olfactory bulbs with the
8. Pyriform lobes. These with 6 and 7 are important parts of the
9. Rhinencephalon, which is bounded laterally by the
10. Sulcus rhinalis.
11. Roots of the Cranial nerves:

I. Olfactory, really a multitude of small nerves that arise from the Olfactory bulbs and pass out through the cribriform plate.

II. Optic, from the Chiasma in front of the Hypophysis.

III. Oculomotor, from near the ventral median line just in front of the Pons.

IV. Trochlearis, from between the Cerebral hemisphere and the Cerebellum.

V. Trigeminal, two roots, from the posterior edge of the Pons. The large root extends forward to the Gasserian ganglion and divides into three branches. Find these, probably in the floor of the cranium.

VI. Abducens, ventral side of the Medulla near the Pons.

VII. Facial, behind V.

VIII. Acoustic, behind VII.

IX. Glossopharyngeal.

X. Vagus. **Take care** not to injure the small roots of these nerves.

XI. Spinal accessory.

XII. Hypoglossal.

Draw the ventral surface showing these features.

With a very sharp scalpel or razor **make** a median longitudinal **incision** through the cerebellum only, and carefully slice away the *left* half of the cerebellum by a series of horizontal sections until the cavity beneath is exposed. With fine scissors cut the Velum medullare posterius lengthwise and remove the left half. (For the human brain see Linebach, '15.)

Observe:

1. Fourth Ventricle, cavity of hindbrain (Herrick and Crosby, fig. 11):
   a. Its floor, Fossa rhomboidea.
2. Cut surface of the cerebellum.
   a. White and Gray matter; the former is called the Arbor vitæ.
3. Cut surfaces of the Corpus restiforme, Brachium pontis, and Brachium conjunctivum.
4. Their connections with the Medulla, the Pons, and the Corpora quadrigemina, roof of the midbrain, page 60.

Carefully slice away the top of the *left* Cerebral hemisphere only, by a series of thin horizontal sections nearly to the bottom of the Sagittal fissure, and expose the

1. Corpus callosum (Fiske, '13, fig. 10).

Make a longitudinal incision through the Corpus callosum and remove the *left* half, and

Expose the

2. Septum pellucidum, connecting the corpus callosum with the
3. Fornix, arch of white fibres from Hippocampus.
4. Left Lateral ventricle.
5. Choroid plexus of the Lateral ventricle.

By cutting away a little at a time of the brain substance, expose

1. Anterior and lateral Horns of the Lateral ventricle.
2. Corpus striatum, floor of ventricle.
3. Hippocampus, posterior gray ridge.
4. Posterior end of the Fornix.
5. Foramen of Monro (Interventricular Foramen, Sobotta, fig. 634), opening to third ventricle.
6. Anterior commissure, below 5.

Remove the occipital and parietal portions of the *left* cerebral hemisphere, and expose the

1. Roof of the Third ventricle,
   a. Pineal body.
   b. Choroid plexus, vascular.
2. Midbrain (Bradley, fig. 79).
   a. Corpora quadrigemina.

Remove the Choroid plexus, and observe the

1. Third ventricle, bounded on the sides by the
2. Thalami (Bradley, fig. 79).

Place the brain ventral side down upon a dissecting board. Insert a very sharp scalpel or razor, wet with alcohol,

between the olfactory bulbs and with its point touching the board draw it backward so as to make an exactly median longitudinal *section* of the brain.

Study the inner surface of the *right* half of the brain (Herrick and Crosby, fig. 10), identifying:

1. Structures previously seen.
2. Gyri and Sulci on the inner surface of the cerebral hemisphere (Bradley, fig. 78).
3. Lamina terminalis, anterior boundary of third ventricle.
4. Infundibulum, pit behind chiasma.
5. Mammillary body, behind 4.
6. Posterior commissure, above entrance to
7. Aquæductus cerebri (Aquæductus Sylvii) connecting third and fourth ventricles.

Identify the five Principal Subdivisions of the brain, and make a list showing the cavity enclosed by each one and the structures which form its roof, floor, and sides. Beginning at the *posterior* end these are:

1. Myelencephalon, medulla from the first pair of cervical nerves to the posterior edge of the pons.
2. Metencephalon, cerebellum and brain stem from the posterior edge of the pons to the velum medullare anterius.
3. Mesencephalon, midbrain from the velum medullare anterius and the anterior edge of the pons to a line connecting the posterior commissure with the posterior margin of the mammillary bodies.
4. Diencephalon, brain stem from the anterior border of the mesencephalon to the depression in front of the optic chiasma, the boundary between the thalamus and the corpus striatum, and the choroid plexus in front of the pineal body.
5. Telencephalon, from the anterior border of the dien-

cephalon to the tips of the olfactory bulbs, including both hemispheres.

Make a drawing of the median section of the brain.

Cut the right half of the brain into transverse sections about a quarter of an inch thick (Fiske, '13, pp. 92–114).

Identify the structures in each section, and observe the arrangement of the

White and Grəy matter.

Draw three typical sections.

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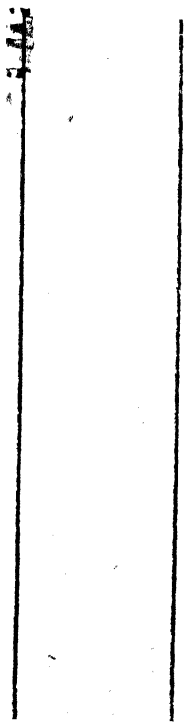

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Directions For the Dissection of the Cat